

# Investigation

## 2

## Examining Growth Patterns

**N**ow that you have learned to recognize exponential growth, you are ready to take a closer look at the tables, graphs, and equations of exponential relationships. You will explore this question:

*How are the starting value and growth factor for an exponential relationship reflected in the table, graph, and equation?*

### Getting Ready for Problem 2.1

Students at West Junior High came up with two equations to represent the reward in Plan 1 of Investigation 1. Some students wrote  $r = 2^n - 1$  and others wrote  $r = \frac{1}{2}(2^n)$ . In both equations,  $r$  represents the number of rubas on square  $n$ .

- Are both equations correct? Explain.
- What is the value of  $r$  if  $n = 1$ ? Does this make sense?
- What is the  $y$ -intercept for this relationship?

### 2.1

## Killer Plant Strikes Lake Victoria

**E**xponential growth occurs in many real-life situations. For example, consider this story from 1998:

Water hyacinths, which experts say double in area every 5 to 15 days, are expanding across Africa's giant Lake Victoria. The foreign plant has taken over more than 769 square miles of the lake and is growing exponentially.

"Killer Weed Strikes Lake Victoria" from *Christian Science Monitor*. January 12, 1998, Vol. 90, No. 32, p. 1.

Plants like the water hyacinth that grow and spread rapidly can affect native plants and fish. This in turn can affect the livelihood of fishermen. To understand how such plants grow, you will look at a similar situation.



### Problem 2.1 $y$ -Intercepts Other Than 1

Ghost Lake is a popular site for fishermen, campers, and boaters. In recent years, a certain water plant has been growing on the lake at an alarming rate. The surface area of Ghost Lake is 25,000,000 square feet. At present, 1,000 square feet are covered by the plant. The Department of Natural Resources estimates that the area is doubling every month.

- A. 1.** Write an equation that represents the growth pattern of the plant on Ghost Lake.
- 2.** Explain what information the variables and numbers in your equation represent.
- 3.** Compare this equation with the equations in Investigation 1.
- B. 1.** Make a graph of the equation.
- 2.** How does this graph compare with the graphs of the exponential relationships in Investigation 1?
- C.** How much of the lake's surface will be covered with the water plant by the end of a year?
- D.** In how many months will the plant completely cover the surface of the lake?

**ACE** Homework starts on page 24.